With eighteen years' observations (1866-83) at Ivigtut, Godthaab, and Jacobshavn, and nine years' (1875-83) at Upernivik, we can now present, with an approximate correctness not hitherto attainable, the distribution of pressure over Greenland during the months of the year. The following mean pressures, at 32° and sea-level, give the highest and lowest, with the months of their occurrence:—

	Highest. Inches.	Lowest. Inches.	Year. Inches.
Ivigtut	29·827 in May.	29·398 in January.	29·666
Godthaab ...	·847 ,,	·445 ,,	·684
Jacobshavn..	·898 ,,	·565 ,,	·749
Upernivik ...	·981 in April.	·603 ,,	·753

Thus in Greenland pressure increases with latitude. The difference between the extreme south and north is in January 0·205 inch, and in spring 0·154 inch; but the difference in summer is small, being in July only 0·008 inch. The above mean of January at Ivigtut 29·398 inches, and for the same month at Stykkisholm in the north-west of Iceland 29·396 inches, are, so far as known, the lowest mean monthly pressures anywhere yet observed in the northern hemisphere; and it is interesting to note that it is in the region immediately to the south and south-west of these places that a very large number of our European storms have their origin.

Attention is forcibly drawn by the 186 charts of pressure and wind to the remarkable fact that the depression areas of Greenland appear to travel from north to south. An extension of the area charted would doubtless show that while in many cases these areas travel northwards yet in a considerable number of cases this direction is more apparent than real. It is, however, abundantly evident that Greenland exerts an important influence on our Atlantic storms that remains still to be investigated.

The most elaborate part of the paper is the discussion of the diurnal curves of pressure from the hourly observations. The curve for the year exhibits the two usual maxima at 8 a.m. and 8 p.m., and the two minima at 2 a.m. and 1 p.m., the morning minimum and the evening maximum being respectively the greater, and these features of the curves are, with one exception, reproduced in the curves for the months. The results will be made to tell their story more clearly if we eliminate the more prominent irregularities attaching to means of one year only, by bloxaming the hourly means, by taking for the hourly means of each month means calculated from that month, the month immediately preceding, and that immediately following it. In these new mean hourly values the morning greatly exceeds the evening maximum in February, March, and April, whereas in every other month the reverse holds good, and that in a very pronounced degree. On the other hand, the morning greatly exceeds the afternoon minimum in each month of the year. From the relations the results show to those for places in similar situations in lower latitudes, we may conclude that unusual care has been taken in securing for the barometer a position where it was subject to only a very small daily change of temperature. It is absolutely necessary that this condition should be attended to, if observations are to be of any use at all in the discussion of the important question of the horary variations of pressure in high latitudes. Since the variations dealt with seldom exceed 0·010 inch, and are generally much less, it is evident that the inquiry is for these regions a refined one; hence it is essential that the attached thermometer should represent the temperature of the whole instrument to within 1° F. *It is the neglect of this point that vitiates* several series of horary barometric observations in the Arctic regions.

Over the open sea in high latitudes during the summer months, where the sun either does not set, or only for a brief interval, the diurnal curve of pressure differs essentially from the above. The observations made by the *Challenger* Expedition in the Antarctic Ocean, and those made by the Norwegian Expedition in the north of the Atlantic, show only one maximum and one minimum in the day, the maximum occurring during the day and the minimum during the night. This peculiar curve is restricted to the open sea of high latitudes. Director Paulsen is inclined to the opinion that the diurnal variation of pressure at Godthaab is caused not so much by local variations of temperature and humidity as by transmissions from lower latitudes of their diurnal variations of pressure. In this opinion we to some extent concur, it being probable that some of the more prominent features of these daily curves of pressure are the results of vast quasi-tidal movements communicated through the higher regions of the atmosphere, in which the space traversed by the individual aërial molecules is not necessarily great.

OUR BOOK SHELF.

Essays and Addresses. By the Rev. James M. Wilson, M.A. (London: Macmillan and Co., 1887.)

IN these "Essays and Addresses" Mr. Wilson deals chiefly with problems connected with religion and morality, and his main object seems to be to show that theological and ethical principles, properly interpreted, are supported, instead of being contradicted, by scientific ideas. The book is evidently the result of much independent reflection. Mr. Wilson tries to grapple with no intellectual difficulty which he has not thoroughly examined, and in all his statements of scientific doctrine he is scrupulously exact. He refers to science in so many aspects that much of what he has to say may be studied with interest even by readers who do not feel that his arguments with regard to such subjects as "Miracles" and "Christian Evidences" are perfectly conclusive.

Introductory Text-book of Physical Geography. By the late David Page, LL.D., F.G.S. Twelfth Edition. (Edinburgh and London: W. Blackwood and Sons, 1887.)

THIS book was originally published about twenty-five years ago, and has done good service in many schools and colleges. After the author's death it was brought up to date by Dr. Charles Lapworth, who, besides making a number of minor corrections and additions, contributed a summary of those results of the *Challenger* Expedition which had reference to the depths, deposits, and temperature of the ocean; an account of British storms; a description of the biological regions of the earth; and a short sketch of Prof. Huxley's arrangement of the human family. In the present edition Dr. Lapworth has again sought to bring the work abreast of scientific knowledge, introducing new matter relating to geology and petrography, meteorology and climatology, and the distribution of animals and plants. On the latter subject he has obtained from Prof. D'Arcy Thompson an excellent summary of recent biological research and theory. The

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value of the book has also been increased by the insertion of several new maps illustrative of the astronomical and meteorological sections.

Longman's New Geographical Reader. Standard VII. (London: Longmans, Green, and Co., 1887.)

THIS "Reader" contains lessons on the ocean, currents, tides, the planetary system, and phases of the moon. The subjects are of more scientific interest than those treated in most books on geography, and are arranged in a progressive and readable form.

The book is divided into sixty lessons, each being followed by a list of some of the words contained in it, with their meanings.

In the chapters on the ocean the subjects are well selected, and the various depths and currents are illustrated by maps. In the lesson on the tides the differential action of the sun and moon on the water of the earth should have been mentioned. The diagram illustrating neap tides has one bad point, the sun being shown as shining on a part of the moon which is turned away from it.

In the diagram on page 231, which represents the sun as seen in full daylight from the surface of the moon, the sun is shown with its corona. The fact of the sun being seen from the moon, which has no atmosphere, would not make the corona visible, but would only tend to intensify the light of the sun and the corona proportionally. It is a pity that this illustration should have been put in without any explanation whatever.

The chapters on the inhabitants of the sea and methods of catching them are very interesting; also the voyages to the Arctic and Antarctic regions. An appendix is added which contains a summary of the whole book.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.*

[*The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to insure the appearance even of communications containing interesting and novel facts.*]

The New Degrees at Cambridge.

THE letter of "Outis" in yesterday's number of NATURE (p. 175) is likely, I fear, to convey a false impression as to the new degrees of Doctor of Science and Doctor of Letters, which, by the way, were instituted, for good or for evil, by the Commissioners, and not by any "dominant body in the University." It is true that Doctors in the new faculty take precedence after Doctors in Medicine just as Doctors in Medicine take precedence after Doctors in Law, and Doctors in Law after Doctors in Divinity, but this distinction is only of importance when a procession has to be marshalled; to all intents and purposes the academic rank of all Doctors is the same.

If it be true, as I believe it is, that the standard for admission to the regular degree of Doctor in Science is only "rather less than that required for admission to the Royal Society," and that the standard for Doctor in Letters is much the same, it follows that the standard for such degrees is much higher than that for any other Doctorate in the University, while that for Doctor in Law is notoriously the lowest of all.

Since the new degrees were instituted the Council has usually offered the new degrees to those persons selected as recipients of honorary degrees whose claims were essentially scientific or literary, while it has continued to give the honorary LL.D. to persons whose distinction was of a less academic kind. This may have been wise or unwise, but the Council had certainly no idea that in what they were doing they were offering to men of science an honour of a lower grade than that to which they had been accustomed. It is true that, fearing perhaps that the less familiar title might at first be not so well understood outside the University, they began by offering to the recipients the choice of the degree of LL.D. or of Litt.D. or Sc.D., as the case might be; but I believe that in all cases those who had the choice preferred the literary or scientific degree.

No doubt these degrees, like that of LL.D., have been and will continue to be given to men of very different degrees of eminence. It is not every year that the University has the opportunity of enrolling among its honorary graduates a man like Asa Gray; but I think that, even if he is excluded, the roll of our honorary Doctors in Science and Letters need not fear comparison with that of the honorary Doctors in Law who have received their degrees within the same period.

Cambridge, June 24. C. T.

Weight, Mass, and Force.

THE position taken up by "P.G.T." and some others in the discussion on the proper use of the words "weight" and "mass" is similar to that assumed by an astronomer coming forward to tell us that we have been calling the stars by their wrong names.

The following extract from an American technical journal is submitted to the consideration of "P. G. T.," Mr. Hayward, and Mr. Alfred Lodge, in order that they should point out for our benefit where they consider the dynamical language is erroneous, and that they should translate it into the terminology necessary in their opinion to make it correct by using the mathematical terminology of poundals, dynes, moms, poundems, &c.

"DESCRIPTION OF THE STRONG LOCOMOTIVE."

American Journal of Railway Appliances, March 15, 1887.

"The weight of the engine in working order is 137,000 lbs., of which 90,000 are on the drivers, 27,000 on the front truck, 20,000 on the back truck. The weight of the tender loaded is 75,000 lbs. The boiler carries 160 lbs. of steam, which pressure is easily maintained when the engine is pulling the heaviest and fastest trains over the 96-feet grades across the mountains.

"The engine having 20-inch by 24-inch cylinders, and 62-inch drivers, the traction force is, according to the well-known formula, $20^2 \times 24 \div 62 = 154{\cdot}8$ lbs. for each lb. of mean effective pressure in the pistons. The resistance of modern rolling-stock as deduced from the most recent experiments both in this country and in Europe is from 12 lbs. per ton of train including engine and tender at speeds of 30 miles an hour to 15 lbs. at 50 miles an hour, above which point the resistance increases in a much greater ratio.

"Let us suppose then that the engine is hauling a train at 30 miles an hour on the level, cutting off at 10 inches of the stroke. From indicator cards taken from the engine under these conditions we find that a mean effective pressure of 100 lbs. is maintained in the cylinders. The traction force exerted will thus be $154{\cdot}8 \times 100 = 15480$ lbs.; and taking the resistance at 12 lbs. per ton, we find the maximum load the engine can pull is $15480 \div 12 = 1290$ tons, and subtracting from this the weight of the engine and tender there remains a weight for the train $1290 - 106 = 1184$ tons, or the equivalent of no less than 59 20-ton cars.

"Now suppose the engine is running up a grade of 96 feet to the mile (1 in 55) at the same speed and cutting off at the same point as before. The resistance to gravity on a 96-feet grade is $2240 \div 55 = 41$ lbs. per ton, and this added to the 12 lbs. resistance on the level gives $41 + 12 = 53$ lbs. per ton for the train going up the grade. Under these conditions the load hauled would be $15480 \div 53 = 292$ tons; or, subtracting the engine and tender, $292 - 106 = 186$ tons, the equivalent of 9½ 20-ton cars.

"Turning now to the question of adhesion, we find that taking the coefficient of adhesion at one-fifth, we have a weight of 18000 lbs., one-fifth the weight on the drivers, as against the 15480 lbs. of traction. We need hardly say that the average coefficient of adhesion is usually higher, one-fourth being generally taken in calculations relating to the performance of locomotives. Under this condition the weight available for adhesion would be 22222 lbs., or one-fourth the weight on the drivers, and the mean effective pressure in the cylinders would have to amount to $22222 \div 154{\cdot}8 = 143{\cdot}6$ lbs. per square inch before the wheels would begin to slip or the use of sand become necessary. At the speed of 30 miles an hour and 100 M.E.P. (mean effective pressure) this engine would exert about 1240 H.P.," &c.

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